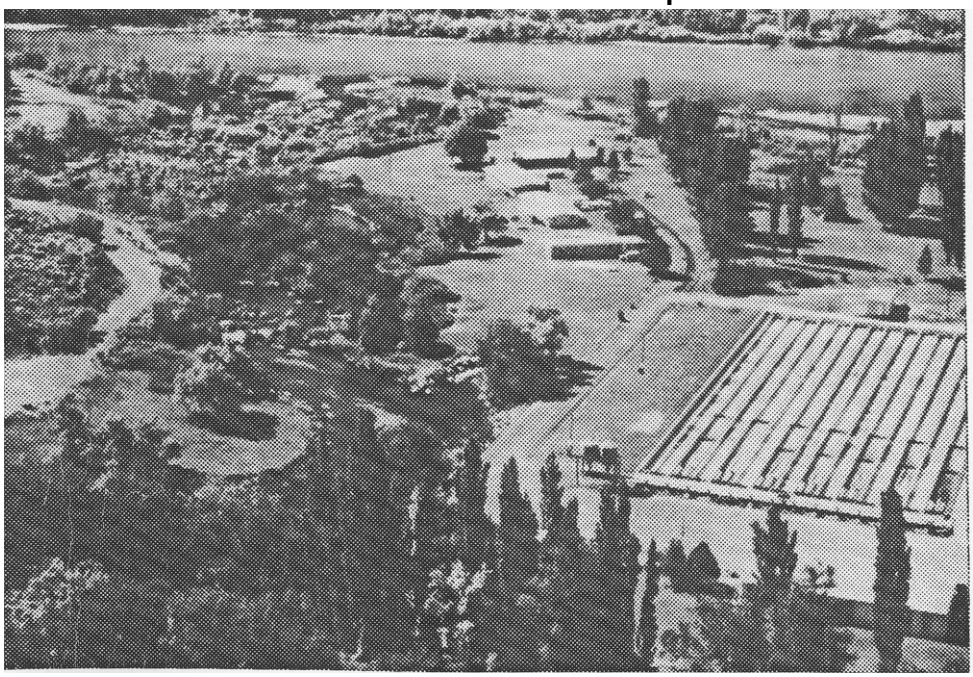
# NIAGARA SPRINGS FISH HATCHERY

**1994 Steelhead Brood Year Report**




**By:**

**Jerry Chapman, Fish Hatchery Manager II**
**Mike Graham, Fish Hatchery Assistant Manager**
**Russell Wood, Fish Culturist**
**Jeremy Olson, Fish Culturist**



**December 1995**
**IDFG 95-46**

## TABLE OF CONTENTS

**Page**



### LIST OF APPENDICES

## ABSTRACT

Niagara Springs Hatchery received no steelhead *Oncorhynchus mykiss,* eggs during the 1994 brood year. Instead, 1,099,915 swimup fry were received from Oxbow Hatchery and 1,042,728 Pahsimeroi fry were received from Sawtooth Hatchery. A total of 2,142,643 fry were received during the month of July.

Losses during the first month after ponding were 0.4% for Hells Canyon fry and 1.3% for Pahsimeroi fry compared to 30.45% and 15%, respectively, the previous year when vats were used instead of the outside raceways. During the rearing cycle, chronic mortality from Infections Hematopoietic Necrosis (IHN) virus and *Aeromonas salmonicida* occurred. A 86.93% survival rate to stocking was achieved.

A total of 1,701,609 smolts (376,060 lb at 4.52 fish/lb) were released into the Snake and Salmon rivers during April 3 to April 28. Additionally, in the fall 160,000 fingerling (4,000 lb at 40 fish/lb) were stocked into C.J. Strike Reservoir. A total of 892,277 smolts (185,900 lb at 4.46 fish/pound) were released in the Pahsimeroi River; 131,152 smolts (29,765 lb at 4.41 fish/lb) were released at Warm Springs; 614,560 smolts (133,720 lb at 4.59 fish/lb) were released at Hells Canyon; 29,400 smolts (6,000 at 4.90 fish/lb) were released at Pine Bar; and 97,220 smolts (20,675 lb at 4.70 fish/lb) were released at Hammer Creek.

A total of 489,960 lb of feed was fed (105,920 lb of Bioproducts and 384,040 lb of Rangen) at a cost of $161,502.42 to produce 380,060 lb of steelhead, for a conversion of 1.29:1.

## INTRODUCTION

Niagara Springs Hatchery is owned and financed by Idaho Power Company (IPC), and operated and staffed by the Idaho Department of Fish and Game (IDFG). It is located in the mid-Snake River Canyon, ten miles south of Wendell, Idaho. Niagara Springs is one of four hatcheries that IPC owns and IDFG staffs and operates that fulfill IPCs mitigation requirement under the Federal Energy Regulatory Commission (FERC) license #1971. The goal of Niagara Springs Hatchery is to rear 400,000 lb of steelhead, *Oncorhynchus mykiss* smolts. Originally, these smolts were used to relocate a portion of the Snake River steelhead run into the Salmon River. Now, 200,000 lb of production are used to sustain the steelhead run below Hells Canyon Dam, and 200,000 lb are stocked in the Salmon River.

## OBJECTIVES

The two major mitigation requirements that must be met at IPC's Niagara Springs Hatchery are to produce quality steelhead smolts to supplement the steelhead trout runs in the Snake River below Hells Canyon Dam and in the upper Salmon River and its tributaries by successfully meeting these objectives:

1. To rear 200,000 lb of quality steelhead smolts to be released in the Salmon River and its tributaries. These are to return as adults to the Salmon River in sufficient numbers to provide a quality sport fishery in these waters and supply sufficient broodstock (1,000 adults) to the Pahsimeroi Fish Hatchery for the collection of spawn for the next production cycle.

2. To rear 200,000 lb of quality steelhead smolts to be released in the Snake River below Hells Canyon Dam. These are to return as adults in sufficient numbers to provide a quality sports fishery in the Snake River and supply sufficient broodstock (1,000 adults) to the Hells Canyon Trap for the collection of spawn for the next production cycle.

## IDAHO DEPARTMENT OF FISH AND GAME GOALS

1. Provide quality steelhead smolts to the Snake and Salmon rivers that will survive the downstream migration and return as adults in sufficient numbers to provide a quality sport fishery in these waters and their tributaries.

2. Provide quality hatchery steelhead for supplementation where wild stocks of steelhead have diminished below desired levels and where managers feel a quality hatchery steelhead would enhance the fisheries resource

3. Enhance the genetic quality of hatchery stocks through management and hatchery practices that favor genetic variability and the wild genetic component.

## FACILITY DESCRIPTION

The hatchery facility consists of an indoor nursery area, outdoor rearing raceways, and two flow-through settling ponds. Spring water supplies 20 upwelling incubators and 20, 6-ft diameter, circular tanks for hatching and early rearing of fry. Incubators and nursery tanks provide 1,130 cubic feet (cf) of hatching and early rearing space.

The outdoor rearing space consists of 19, 300 by 10 ft (142,500 cf) of raceways, which are supplied by constant temperature, gravity flow spring water. This allows for the production of 400,000 lb of steelhead to a density index of less than the recommended .35. In addition, the odd numbered raceways are divided in the upper sections into two 4.5 ft x 20 ft raceways (3270 cf) for fry and fingerling rearing.

Two flow-through settling ponds (150 x 60 ft) have been constructed to remove settleable solids from the hatchery effluent discharge. The settling ponds handle all the flow from the raceways and meet E.P.A. guidelines for effluent discharge.

The hatchery feeding system is completely automated. Two moveable bridges span the rearing area. A total of 19 Nielsen automatic feeders are mounted on the bridges. The fish are fed by moving the bridges down the length of the rearing area and energizing the individual feeders on the control panels. Bulk feed is dispensed to the feeders by a conveyor supplied by two, 20,000 storage bins with an associated fines separator. Nursery areas are fed by Ziegler belt feeders.

Pond cleaning is also automated. An air blower cleaning system has been installed for the raceways. Three blower motors supply approximately 10 lb per square inch to the weighted, perforated, air lines on the bottom side corner of each pond. The resulting bubble screen creates a vortex of water currents that keep waste material suspended along the length of the ponds. This systems saves many hours of labor sweeping ponds.

A sprayer system was installed to keep depredating birds from eating fish during the rearing cycle. The system is powered by two 15 hp pumps that delivers 292 gpm at 140 ft TDH. The water is delivered to the system from the headrace into two-inch ultraviolet resistant plastic pvc pipe with Rainbird spray nozzles spaced 10 ft apart. The spray system appears to work quite efficiently at keeping birds away. Unfortunately, the spray causes icing on the bridge rails during freezing weather, so the system cannot be used during the winter months, leaving the fish exposed to heron depredation.

Buildings on the hatchery grounds include four residences (three wood, frame houses, and a 14-ft wide mobile home. The metal hatchery building (32 x 80 ft) contains the office, two incubator rooms, garage, shop, and feed storage room. One storage building (10 x 30ft), one cinder block chiller building (70 x 45 ft) enclosing the chiller, blower-electrical room, and a heated shop, and garage.

## WATER SUPPLY

In addition to Niagara Springs Hatchery, Niagara Springs supplies water to Rim View Trout Company, IDFG Niagara Spring's Wildlife Management Area, and Idaho State's Pugmire Park. Niagara Springs total flow is 220 cubic feet per second (cfs), which is divided into water rights by the four users. Niagara Springs Hatchery has a water right for 132 cfs.

Water temperature is a constant 59◦F and flows by gravity to the incubators, nursery vats, raceways, irrigation system, fire hydrants, and domestic water system..

Increased demand on the aquifer by agricultural and domestic uses has caused a decline in both quality and quantity of water in the spring. As ground water demands have expanded and drought conditions continue, the springs have declined by 30% to 40% of historic conditions.

On April 22, 1994 a water analysis was taken and findings are in Appendix 2.

## STAFFING

Niagara Springs Hatchery is staffed by four permanent and two temporary personnel. Hatchery management is handled by a Fish Hatchery Manager II, Jerry Chapman, and Fish Hatchery Assistant Manager, Mike Graham. There are two Fish Culturists, Russ Wood and Jeremy Olson, to handle most operational duties. During peak work loads there are two Bioaides, Gene Waltz and Mike Anderson, that assist the permanent staff with culture, maintenance, and other assignments. During this fish year, Fish Hatchery Assistant Manager Gary Bertellotti was promoted to Fish Hatchery Manager I at Pahsimeroi Hatchery and Roger Elmore transferred to Sawtooth Hatchery.

## FISH PRODUCTION

### Egg Shipments and Early Rearing

Niagara Springs Hatchery did not receive any eggs during the 1994 brood year. Only buttoned-up fry were brought onto the station because of construction on the new raceways. Hells Canyon eggs were hatched in well water (43◦F) and held to swimup stage at Oxbow Hatchery. Pahsimeroi eggs were transferred to Sawtooth Hatchery where they wee hatched and raised in well water (41◦F) to swimup state before transporting them in July as fry, still in the trays, via a two-ton fish truck.

There were three truckloads of Pahsimeroi fry ponded on July 5, 7, and 1, 1994. A total of 1,042,728 swimup fry were ponded in the outdoor nursery raceways (Appendix 2). Mortality was 1.3% for the first month after ponding compared to nearly 15% the previous year (Jerry Chapman and Roger Elmore, 1993). This large improvement can be attributed to the fact that the circular vats were not used for fry rearing. High mortality in the circular vats, the previous year, was do to high densities and suffocation.

There were three truck loads of Hells Canyon fry ponded on July 15, 20, and 22, 1994. A total of 1,099,915 swimup fry were ponded in the outdoor nursery raceways. Mortality for the first month after ponding was 0.4% compared to 30.45% the previous year when the vats were used.

Bioproducts feed was again used for early rearing. BioDiet feed was used for the starter sizes through #3. BioDry 1000 and 4000 was used up to 3.0mm. BioDry 500 was used for 4.0mm and 5.0mm.

### Final Production Rearing

Once the fish outgrow the nursery area, they are moved to 60 ft, then 100 and 200 ft. Next, fin clipping operations are used to split the fish into even and odd numbered raceways. During this program, fish are crowded down to the lower 100 ft section. Half of the fish are then clipped into the upper two thirds of the

raceway, while the other half of the fish are clipped into the adjacent raceway. Fin clipping operations started this past year during the last week of October, and were completed by November 15.

A combination of Bioproducts and Rangen fish foods were fed over the course of the year. Bioproducts was mostly fed to steelhead under 20/lb, while Rangen's bulk feed was fed to the larger fish until release. A total of 489,960 lb of feed (105,920 lb of Bioproducts and 384,040 of Rangen) was fed at a cost of $161,502.42 (Appendix 3). The average cost/lb of feed was 33 cents. Three loads of Bioproducts bulk feed in 4.0mm and 5.0mm were used to test Bioproducts feed delivery system. A total of 380,060 lb of steelhead were produced on 489,960 lb of feed for a conversion of 1.29.

Length frequencies (Appendix 4) were taken prior to release (March 30). The average fork length of fish reared at Niagara Springs was 7.979 inches (202.6mm) at 4.5 fish/lb).

Fin quality was assessed using the "Ashton method" of qualitative fin measurements. Fins of steelhead reared at Niagara Springs were compared to wild rainbow trout collected from the Henrys Fork. A total of 100 fish from four raceways and the settling ponds were analyzed for fin degradation. After measuring the dorsal and two pectoral fins from each fish and comparing the average fin length to the average fork length, fins from fish raised in raceways at Niagara Springs were only 55.5% of wild fish fins, while fish fins from fish taken from the fish salvaged from the hatchery's settling ponds were 95% of wild fish fins (Appendix 5).

Fin quality varied considerably among the groups measured. In the settling pond, densities are very low and the fish fins were nearly perfect. In raceway #10, densities were about half the other raceways, due to an error in loading of coded-wire tagged fish, and the fish fins were 65% wild fins. Densities in the other raceways were normal and consequently fins were about 53% of wild fish fins.

Two fish tankers belonging to IPC and one belonging to the Army Corps of Engineers, contracted by Neil Ring, began hauling fish on April 3 and finished on April 28. A total of 73 loads of fish were transported to Hells Canyon and several points on the Salmon River (Appendix 6). Release figures are as follows: Pahsimeroi Hatchery weir received 829,277 fish at 4.46 fish/lb; Warm Springs (Little Salmon River) received 131,152 fish at 4.41 fish/lb; Hells Canyon received 614,560 fish at 4.59 fish/lb; Pine Bar (Lower Salmon) received 29,400 fish at 4.9 fish/lb; and Hammer Creek (Lower Salmon) received 97,220 fish at 4.7 fish/lb. In addition to normal smolt transport, 160,000 Pahsimeroi stock fish were planted at 40 fish/lb in C.J. Strike Reservoir October 16, 1994 at Cottonwood boat ramp.

## FISH HEALTH

Fish health is always a concern at Niagara Springs Hatchery. The location of Niagara Springs in the heart of the commercial trout industry makes it vulnerable to the horizontal transmission of many etiologic agents. Disease problems from IPNV, IHNV, bacterial furunculosis *Aeromonas salmonicida*, and bacterial coldwater disease *Flexibacter psychrophilus* have caused significant losses in years past (Munson, 1963). Also, the hatchery and spring (water source) are located directly below agricultural land, exposing both to toxic drift and runoff from chemical application to fields above the hatchery. Stringent sanitation programs are implemented to facilitate disease control.

The first portion of the rearing year was virtually disease free. As colder winter months arrived, the bird hazing sprayers froze the rails of the traveling bridge and the sprayers were turned off. Consequently, piscivorous birds arrived on station. Ten days later, an IHNV epizootic was confirmed. As the year progressed, *A. salmonicida* infections appeared and were confirmed by Eagle Fish Health Laboratory personnel. Because of the history of furunculosis at Niagara Springs Hatchery, and because of the resistance to Oxytetracycline of this strain, the entire hatchery was treated with a five-day application of Romet-30

medicated feed. A few weeks later, signs of the disease again appeared and the hatchery was treated again with Romet-30. A 42-day withdrawal period was observed before these fish were released.

The organosomatic index showed normal values in all categories for both Pahsimeroi stock steelhead, while the Hells Canyon stock showed normal values in all categories except 2 of the 20 eyed samples. The mean hematocrit value was 43.47 while the mean serum protein value was 5.45. Fish fins were eroded.

Acute losses were caused by IHNV and *A. salmonicida.* The average daily mortality was .0158%. Romet-30 was helpful in controlling mortalities in several raceways. Raceways which did not show signs of improvement most likely were experiencing IHNV.

In order to improve fish health at Niagara Springs, several impediments to fish culture must be corrected. The nursery rearing should be expanded and improved, and the spring intake should be enclosed. Furthermore, a complete exclusion of piscivorous birds from the hatchery would be the best solution to the bird problem at Niagara Springs.

## FISH MARKING

### Fin Clipping

All hatchery-reared steelhead in the state are marked with an adipose fin clip. Adipose fin clipping is done so that sportsmen can differentiate between hatchery and wild steelhead. The clipping process also gives the hatchery staff an accurate inventory of fish on the station, since all fish are counted during clipping. Steelhead at Niagara Springs Hatchery were clipped between October 24 and November 15,1994.

### Coded-Wire Tags and PIT Tags

The brood year 1994 steelhead were coded-wire tagged (CWT) from November 21 through December 2. A total of 246,064 fish were tagged for four release groups (Appendix 7). The CWT fish were released at the Pahsimeroi fish trap, Hells Canyon, Warm Springs (Little Salmon River), and Hammer Creek (lower Salmon). A total of 38,390 fish (CWT group, 10-20-19) were released at Warm Sprigs on April 15 and 16, while 64,953 fish (CWT group 10-30-46) were released at Pahsimeroi fish trap between April 3 and 14. Hells Canyon received 61,406 fish (CWT group, 10-30-47) between April 17 and 27, and Hammer Creek received 64,058 fish (CWT group, 10-30-48) on April 27 and 28.

In addition to the CWT fish, 1,200 fish were tagged with PIT tags (Passive Integrated Transponders) on March 6 and 7, 1995. These computer chips are injected into the body cavities of the fish and can be accessed to give such information as hatchery origin, length, weight, release watershed, and date of release. In this manner, an individual fish can be traced on its seaward migration without sacrificing the fish. A total of 295 PIT-tagged fish were released at Warm Springs, 299 were released at Pahsimeroi trap, 298 were released at Hells Canyon Dam, and 299 were released at Hammer Creek (Appendix 8).

## RECOMMENDATIONS

### Completed Improvements

#### Building Maintenance and Hatchery Improvements

Several major improvements have been completed this past year. Five new raceways and nursery sections have been added to bring the total rearing area to 19 raceways. A new feeding bridge has been constructed to span the new raceways. A new bulk feed delivery system that includes a fines separator has been constructed to replace the old bulk delivery system. A new headgate structure was constructed with a new flow meter system to accurately measure water flows to the raceways. Two new settling ponds were constructed to keep the hatchery in compliance with EPA discharge permits. A new chiller building was constructed to house the chiller and air blower systems and to provide additional storage and shop space. A water sprayer system was constructed to keep predatory birds away from the raceways. A fence was built around the rearing area, the settling ponds, and hatchery outlet to provide visitor protection from drowning hazards. A visiter kiosk was build to provide information about the hatchery and IDFG programs. The borders of the driveways, kiosk, settling ponds and yards were landscaped. A new sprinkler system was installed in the yards. The IPC park across from the hatchery was also landscaped.

### Needed Improvements

#### Early Rearing and Incubation

The upwelling incubators and circular vats are not adequately designed to safely hatch and rear fry that are required for the station's mitigation. Because of high rearing densities, suffocation occurs when fish are allowed to swim out of incubators and subsequently pile up on the bottoms of the vats.

An expansion of the present nursery facility to at least twice or three times the present size would adequately accommodate early rearing systems. In this expansion, the 20 round nursery tanks should be replaced with early rearing raceways. The number of raceways would be based on optimum density indices and the grow-out time needed to get the fish to a larger size (250 to 500 fish/lb) before moving them to outside raceways. This system would increase rearing volume, protect smaller fry from bird predation, and provide them with shade from the sun.

The current incubation water intake is shared with the irrigation and domestic system. When irrigation lines are activated, air is taken into the system causing "bubbling" in the incubators. Air is then trapped beneath the eggs and causes suffocation. A new line that is separate from the irrigation and domestic lines needs to be constructed to accommodate the nursery facilities. Currently, there is not enough water to operate the nursery vats because of reduced spring flows.

### Final Rearing

An investment in aluminum dam boards would reduce the expense for the constant replacement of wooden boards and help prevent disease transmission.

## Employee Safety

The eight-inch wide raceway walls are used as walkways to clean screens and raceways. Walking these walls is a safety problem all year and becomes extremely dangerous in the winter. Nonskid walkways need to be installed the full length of the raceway wall to eliminate this hazard.

A “trash-rack” needs to be installed in front of the intake gate at the upper pool to prevent access to the spring and injury to the public.

## Hatchery Residences

There is a need for television station reception at all the houses. The installation of satellite dishes and receivers would improve morale and may keep employees around after work hours and improve security of the station.

With the degradation of the spring water, domestic water must be treated by chlorination before use. Coliform and fecal bacteria have been found in the drinking water. Drilling a domestic well would eliminate the problem.

There is also a need for one more wood frame house that would replace the old trailer. There are four full time employees at this station and adequate housing for only three.

## Water Source

Niagara Springs Hatchery has a water right of 132 cfs. Niagara Springs flow volume has been declining yearly, as have most springs along this part of the Snake River. Output of area springs as measured by the Idaho Aquaculture Association has dropped 2,000 cfs in the past ten years. Also, there is a noticeable decline in water volume that coincides with the start of irrigation in the spring of the year.

The water collection box, that supplies the incubator rooms, is located near the top of the spring and the amount collected is not enough to safely produce fry. It would seem reasonable to move the collection box to a place in the spring where more water could be collected. However, this is not possible because it would interfere with a population of endangered snails and their habitat. Therefore, plans are being developed to tap into the existing pipeline delivering water to the raceways, or the hatchery head pool, as a new supply source.

## Building Improvements

A new hatchery and incubation building with functional nursery raceways is badly needed. The building should also include public restrooms that are handicap accessible, office, shop, and an adequate feed storage space.

## LITERATURE CITED

Chapman, Jerry and Roger Elmore, 1993. Niagara Springs Steelhead Hatchery 1993 Brood Year Report. Niagara Springs Steelhead Hatchery, 2131 Niagara Springs Road, Wendell, Idaho

Munson, A. D. 1995. Niagara Springs Fish Health Inspection Report. IDFG Eagle Fish Health Laboratory. 1800 Trout Road, Eagle, Idaho.

**APPENDIX**

Appendix 1. Water analysis of Niagara Springs Fish Hatchery, April 22, 1994.

| Analysis | | Results | Maximum Contamination Level |
|---|---|---|---|
| General | | | |
| Alkalinity | | 166.000 | |
| Hardness | | 234.000 | |
| pH | | 8.000 | |
| Phosphorus | | 0.600 | |
| Primary | | | |
| Antimony | | 0.002 | 0.006 |
| Arsenic | | 0.005 | 0.050 |
| Barium | | 0.100 | 1.000 |
| Beryllium | | 0.0002 | 0.004 |
| Cadmium | | 0.00034 | 0.005 |
| Chromium | | 0.002 | 0.100 |
| Copper | | 0.010 | 1.300 |
| Lead | | 0.002 | 0.015 |
| Mercury | | | 0.0002 0.002 |
| Nickel | | 0.003 | 0.100 |
| Selenium | | 0.005 | 0.050 |
| Sodium | | 30.800 | |
| Thallium | | 0.0006 | 0.002 |
| Other | | | |
| Cyanide | | 0.005 | 0.200 |
| Fluoride | | 0.570 | 4.000 |
| Iron | | 0.010 | 0.300 |
| Nitrite | | 0.010 | 1.000 |
| Nitrate | | 1.630 | 10.000 |
| Sulfate | | 60.700 | |
| Radiology | Gross Beta | 2.800 pCVl | 50.000 |
| | Gross Alpha | 4.000 pCVl | 15.000 |

Appendix 2. Niagara Springs Hatchery Survival of Steelhead Fry to Smolt.

| Fry Source | Fry Received | Smolts Released | % Survival Fry to Smolt |
|---|---|---|---|
| Pahsimeroi | 1,042,728 | 741,180 | 86.42% |
| Oxbow | 1,099,915 | 960,429 | 87.31% |
| Totals | 2,142,643 | 1,701,609 | 86.93% |

Appendix 3. Niagara Springs Hatchery production costs.

| Number of Fish | Lbs of Feed | Cost of Feed | Pounds of Fish | Feed Cover. | Total Cost | Cost/ 1,000 | Cost/ Pound |
|---|---|---|---|---|---|---|---|
| 1,861,609 | 489,960 | $161,502.42 | 380,060 | 1.29 | $688,863.25 | 370.04 | $1.81 |

Cost includes IPC cost for overhead, smolt hauling, and shop expenditures.

Appendix 4. Length Frequencies at Release for Four Raceways

| | Pahsimeroi | | Hells Canyon | |
|---|---|---|---|---|
| Raceway Number | 5 | 10 | 14 | 19 |
| Sample Size | 20 | 20 | 20 | 20 |
| Average length (mm) | 206 | 191 | 192 | 190 |
| Lower range (mm) | 125 | 115 | 116 | 83 |
| Upper range (mm | 257 | 260 | 246 | 240 |

| | (mm) | (inches) |
|---|---|---|
| Pahsimeroi average length | 198 | 7.8 |
| Hells Canyon average length | 190 | 7.66 |
| Overall average length | 196.3 | 7.73 |

Appendix 5. Fin Lengths of Niagara Springs Steelhead.

| | | Average of 20 fish groups (mm) | | | | |
|---|---|---|---|---|---|---|
| N.S. Raceway | Fork Length | Right Pectoral | Left Pectoral | Dorsal | Fin Length | Fin Factor |
| 5 | 210 | 18 | 18 | 6 | 14 | 51 |
| 10 | 217 | 24 | 22 | 9 | 18 | 65 |
| 14 | 188 | 15 | 17 | 6 | 13 | 52 |
| 19 | 203 | 17 | 18 | 7 | 14 | 57 |
| Average | 204.5 | 18.5 | 18.8 | 7 | 14.8 | 55.5 |

Appendix 6. Niagara Springs Steelhead Smolt Distribution in the Salmon and Snake Rivers.

| Destination | Stock | Weight | Number Per pound | Number Released |
|---|---|---|---|---|
| Pahsimeroi Weir | Pahsimeroi | 185,900 | 4.46 | 829,277 |
| Warm Springs | Pahsimeroi | 29,765 | 4.41 | 131,152 |
| Hells Canyon Dam | Hells Canyon | 133,720 | 4.59 | 614,560 |
| Pine Bar Rapids | Hells Canyon | 6,000 | 4.90 | 29,400 |
| Hammer Creek | Hells Canyon | 20,676 | 4.70 | 97,220 |
| Total | | 376,060 | 4.52 | 1,701,609 |

Appendix 7. Brood Year 1994 CWT Summary for Steelhead at Niagara Springs Hatchery.

| Raceway | Release Site | CWT Number | Number Tagged | Mortality To release | Number Shed | Number Released | Untagged | Total Group Released |
|---|---|---|---|---|---|---|---|---|
| 1 | Pahsimeroi | 10-30-14 | 67,828 | 866 | 2,009 | 64,953 | 762,315 | 829,277 |
| 10 | Warm Springs | 10-20-19 | 46,245 | 668 | 1,187 | 38,390 | 91,576 | 131,152 |
| 12 | Hells Canyon | 10-30-47 | 65,055 | 1,750 | 1,899 | 61,406 | 551,255 | 614,560 |
| 19 | Hammer Creek | 10-30-48 | 66,936 | 895 | 1,981 | 64,058 | 31,181 | 97,220 |
| | Totals | | 246,064 | 4,179 | 7,076 | 228,807 | 1,436,327 | 1,672,209* |

*Does not include 29,400 fish released at Pine Bar.

Appendix 8. Brood Year 1994 PIT tag Summary for Steelhead at Niagara Springs Hatchery.

| Raceway | Release Site | Number Tagged | Number Released | Mortality |
|---|---|---|---|---|
| 1. | Pahsimeroi Weir | 300 | 295 | 5 |
| 10. | Warm Springs | 300 | 299 | 1 |
| 12. | Hells Canyon | 300 | 298 | 2 |
| 19. | Hammer Creek | 300 | 299 | 1 |
| | Totals | 1,200 | 1,191 | 9 |

Appendix 9. Niagara Springs Hatchery Monthly Water Requirements.

| | | | |
|---|---|---|---|
| May | 50 cfs | November | 70 cfs |
| June | 50 cfs | December | 90 cfs |
| July | 50 cfs | January | 100 cfs |
| August | 50 cfs | February | 110 cfs |
| September | 50 cfs | March | 120 cfs |
| October | 60 cfs | April | 120 cfs |

Appendix 10. Niagara Springs Hatchery History, BY66 to present.

| Year | Pahsim. Eggs/Fry Received | Oxbow Eggs/Fry Received | Total Eggs/Fry Received | Total Yearly Mort | % Mort Yearly | Fall Releases | Salmon R Smolt Releases | Hells C Smolt Releases | Spring Releases | Total Lbs Released | Feed Fed Total Lbs | Conv | Fish/lb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1965-66 | 0 | 3,085,194 | 3,085,194 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1966-67 | 0 | 2,605,288 | 2,605,288 | 623,533 | 23.93 | 29,400 | 1,364,842 | 587,513 | 1,952,355 | 153,552 | 305,890 | 1.99 | 12.71 |
| 1967-68 | 0 | 3,215,652 | 3,215,652 | 1,209,183 | 37.60 | 0 | 1,664,325 | 342,144 | 2,006,469 | 204,251 | 298,450 | 1.46 | 9.82 |
| 1968-69 | 0 | 2,469,536 | 2,469,536 | 695,219 | 28.15 | 0 | 1,665,117 | 109,200 | 1,774,317 | 184,186 | 280,430 | 1.52 | 9.63 |
| 1969-70 | 1,477,695 | 1,927,727 | 3,405,422 | 654,022 | 19.21 | 757,500 | 1,608,000 | 385,900 | 1,993,900 | 299,235 | 502,410 | 1.68 | 6.66 |
| 1970-71 | 1,330,494 | 1,480,150 | 2,810,644 | (305,176) | -10.86 | 670,960 | 1,630,002 | 0 | 2,444,860 | 202,025 | 384,040 | 1.90 | 12.10 |
| 1971-72 | 1,439,842 | 700,061 | 2,139,903 | 153,603 | 7.18 | 215,625 | 1,555,050 | 0 | 1,770,675 | 235,375 | 376,080 | 1.60 | 7.52 |
| 1972-73 | 8,850,764 | 1,819,721 | 10,670,485 | 3,105,637 | 29.10 | 3,008,664 | 1,543,349 | 0 | 4,556,184 | 163,839 | 266,800 | 1.63 | 27.81 |
| 1973-74 | 3,663,990 | 1,264,384 | 4,928,374 | 2,953,847 | 59.94 | 0 | 1,960,378 | 0 | 1,974,527 | 187,494 | 319,130 | 1.70 | 10.53 |
| 1974-75 | 3,160,144 | 280,098 | 3,440,242 | 2,108,426 | 61.29 | 0 | 1,331,280 | 0 | 1,331,816 | 166,640 | 352,890 | 2.12 | 7.99 |
| 1975-76 | 2,234,978 | 51,559 | 2,286,537 | 513,688 | 22.47 | 40,977 | 1,690,390 | 0 | 1,731,872 | 248,708 | 437,600 | 1.76 | 6.96 |
| 1976-77 | 2,487,824 | 730,862 | 3,218,686 | 1,642,383 | 51.03 | 0 | 1,433,675 | 141,005 | 1,576,303 | 251,835 | 454,762 | 1.81 | 6.26 |
| 1977-78 | 2,540,728 | 517,250 | 3,057,978 | 1,229,537 | 40.21 | 281,208 | 1,266,025 | 0 | 1,547,233 | 154,829 | 370,080 | 2.39 | 9.99 |
| 1978-79 | 2,048,350 | 441,069 | 2,889,419 | 426,977 | 17.15 | 344,944 | 1,372,454 | 0 | 1,717,498 | 244,887 | 643,680 | 2.63 | 7.01 |
| 1979-80 | 2,622,425 | 124,814 | 2,747,239 | 203,985 | 7.43 | 548,987 | 1,097,060 | 348,220 | 1,994,267 | 314,100 | 629,580 | 2.00 | 6.35 |
| 1980-81 | 1,697,010 | 498,416 | 2,195,426 | 720,172 | 32.80 | 0 | 862,494 | 612,760 | 1,475,254 | 316,330 | 622,930 | 1.97 | 4.66 |
| 1981-82 | 2,003,418 | 298,952 | 2,302,370 | 953,015 | 41.39 | 0 | 995,205 | 354,150 | 1,349,355 | 374,350 | 663,850 | 1.77 | 3.60 |
| 1982-83 | 2,313,339 | 253,776 | 2,567,115 | 1,431,975 | 55.78 | 500,000 | 542,390 | 92,750 | 635,140 | 181,150 | 448,860 | 2.48 | 3.51 |
| 1983-84 | 2,749,292 | 709,716 | 3,459,008 | 1,849,313 | 53.46 | 499,070 | 752,195 | 408,430 | 1,160,625 | 310,000 | 632,400 | 2.04 | 3.74 |
| 1984-85 | 2,333,760 | 598,404 | 2,932,164 | 613,771 | 20.93 | 630,500 | 1,273,181 | 414,712 | 1,687,893 | 314,650 | 541,198 | 1.72 | 5.36 |
| 1985-86 | 1,332,152 | 1,582,340 | 2,914,492 | 903,999 | 31.02 | 330,640 | 860,358 | 819,495 | 1,679,853 | 339,885 | 580,850 | 1.71 | 4.94 |
| 1986-87 | 1,339,176 | 935,195 | 2,274,371 | 422,476 | 18.58 | 39,995 | 1,011,900 | 800,000 | 1,811,900 | 419,000 | 557,960 | 1.33 | 4.32 |
| 1987-88 | 1,640,040 | 1,289,029 | 2,929,069 | 775,569 | 26.48 | 404,000 | 862,100 | 877,400 | 1,749,500 | 405,515 | 584,290 | 1.44 | 4.31 |
| 1988-89 | 1,256,289 | 1,213,399 | 2,469,688 | 803,488 | 32.53 | 0 | 930,700 | 735,500 | 1,666,200 | 406,800 | 574,770 | 1.41 | 4.10 |
| 1989-90 | 1,925,795 | 833,397 | 2,759,192 | 252,892 | 9.17 | 603,000 | 956,100 | 947,200 | 1,903,300 | 465,400 | 597,310 | 1.25 | 4.09 |
| 1990-91 | 1,966,434 | 113,190 | 2,079,624 | 311,624 | 14.98 | 0 | 856,000 | 912,000 | 1,768,000 | 484,025 | 632,030 | 1.28 | 3.65 |
| 1991-92 | 650,400 | 691,500 | 1,341,900 | 311,400 | 23.21 | 0 | 786,000 | 243,900 | 1,030,500 | 232,500 | 283,000 | 1.22 | 4.43 |
| | Wallowa | 812,000 | 812,000 | 394,936 | 48.64 | 0 | 417,064 | 417,064 | 72,786 | | -- | | 5.73 |
| 1992-93 | 1,131,951 | 1,013,846 | 2,145,797 | | | | 761,800 | 353,600 | | 235,075 | -- | | |
| 1992-93 | Babington's | | *Babington's released Little Salmon | | | | *222,560 | 306,907 | **47,089 | 131,090 | -- | | |
| | | | **Brownlee Reservoir | | | | | | | | | | |
| 1993-94 | 954,294 | 1,509,596 | 2,463,890 | 1,263,820 | 54.89 | 0 | 928,981 | 609,115 | 1,538,096 | 350,151 | 440,143 | 1.26 | 4.40 |
| 1994-95 | 1,042,723 | 1,099,915 | 2,142,638 | 440,029 | 20.54 | 0 | 741,180 | 960,429 | 1,702,609 | 376,060 | 489,960 | 1.29 | 4.52 |

Submitted by:

Jerry Chapman
Fish Hatcheries Manager II

Mike Graham
Fish Hatchery Assistant Manager

Russell Wood
Fish Culturist

Jeremy Olson
Fish Culturist

Idaho Department of Fish and Game

_____

Steven M. Huffaker, Chief
Bureau of Fisheries

_____

Tom Rogers
Fish Hatcheries Supervisor